Awards for Research: An Opportunity for New Research Endeavors

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The Faculty Awards for Research (FAR) program from NASA's Code EU has proven an excellent venue for young investigators at Minority Institutions (MIs) to obtain the start-up funds to establish their research program. The FAR is a single investigator award for up to $100,000 a year for a maximum of three years.

The Visualization of Atmospheric Water Vapor Data from SAGE (ViSAGE) project at Norfolk State University has been funded by a FAR award. These funds provided for the establishment of the Scientific Visualization Group at Norfolk State University and equipment for the Spartan Scientific Visualization Laboratory. Twelve students have been directly involved on atmospheric science research and scientific visualization. Seven publications with student co-authors have resulted from the research work. Although the FAR is a single investigator award, other faculty at Norfolk State University have developed an interested in Scientific Visualization and have participated in some aspects of the project. In addition, as a result of the FAR award the speaker has obtained a NASA Earth Science Enterprise grant for the Research Experience in Earth System Science programs at Norfolk State University and the prestigious NASA Administrator's Fellowship. Results of the research performed under these awards are briefly described below.

Scientific Visualization

The vast amounts of data obtained from remote sensing probes demands the development of user friendly data conditioning, analysis and visualization tools. To fully accomplish the goals of a mission, data conditioning, analysis and visualization tools that exploits the capabilities of the instrument are essential.

A scientific visualization software package (EzSAGE) has been created to easily extract, sort, condition and visualize data from the Stratospheric Aerosol and Gas Experiment II (SAGE II) instrument. SAGE II measures ozone, water vapor, nitric oxide, and aerosol as a function of latitude, longitude, and altitude. With EzSAGE the user can sort, condition and display the data in any choice of three-dimensional perspective by few clicks of the mouse. Figure 1. shows ozone concentrations vs. latitude-longitude, altitude-latitude, and altitude-longitude perspectives obtained from EzSAGE. These visualizations show relationships between atmospheric chemical species, effect of spatial dynamics, seasonal and annual trends, and provide an understanding of the atmospheric dynamics.

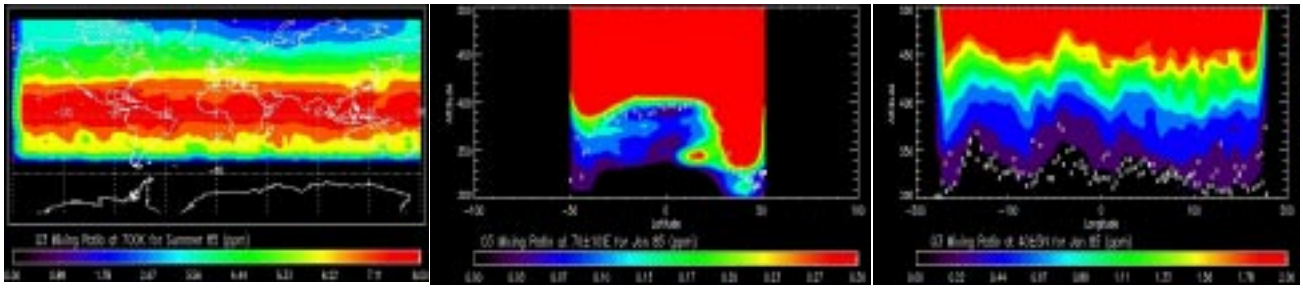

Figure 1.Ozone mixing ratio measured by the SAGE from various perspectives.

Atmospheric Science

Stratosphere-Troposphere Exchange (STE) is of significant importance to the chemistry and dynamics of the atmosphere. Monthly dependence of intrusions from tropospheric air into the stratosphere and

stratospheric air into the troposphere (STE air masses) have been studied utilizing five years (1985-1990) of Stratospheric Aerosols and Gas Experiment II (SAGE II) water vapor and ozone measurements. Stratospheric air masses in the troposphere were identified by high ozone and low water vapor readings relative to isentropic tropospheric averages. Tropospheric air masses in the stratosphere were identified by high water vapor and low ozone measurements relative to the stratospheric averages. Frequency ratios of STE air masses to total measured occultations were calculated to determine zonal STE activity. Monthly climatologies of STE frequency ratios utilizing the five years of data were studied.

The results show a strong seasonal cycle. Higher frequency of tropospheric moist intrusions in to the stratosphere is observed during the summer hemisphere with the Northern Hemisphere exhibiting more activity than the Southern Hemisphere. This is attributed to the summer monsoons and high frequency of sub-tropic tropopause wave breaking events in the summer hemispheres [*Chen*, 1995; *Postel and Hitchman*, 1999]. These results are in good agreement with the model investigation by *Chen* [1995], the aircraft measurements by *Ovarlez et al.* [1999], and the results of the lower stratosphere water vapor investigation using SAGE II data by *Pan et al.* [1997].

High frequency of stratospheric intrusions in the troposphere is observed in the winter and spring hemisphere. These results are attributed to the higher frequency of tropopause folding events associated with middle latitude synoptic scale baroclinic disturbances in the mid-latitude tropopause during spring [*Holton et al.*, 1995].

Conclusion

The FAR award has provided the initial funds to establish the speaker's research program at Norfolk State University. Efforts in scientific visualization and atmospheric science are currently on going. Many students and some faculty members have been involved in the effort related to this award producing various publications. Other awards have been obtained as result of the FAR. Outcomes from the ViSAGE FAR will continue for long after the funds have been utilized.

Programs such as the FAR are of significant importance to MIs. Unfortunately start-up funds for research are generally not available at Minority Institutions. The FAR funds provide the opportunity for young MI faculty to establish their research program, establish a research record, and compete for other sources of funding; undertakings that are nearly impossible without start-up funds.

References

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